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Neuroscience
Published: 13 November 2013
doi:10.3389/frym.2013.00004

Facebook, being cool, and your brain: what science tells us

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Reviewed by:

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14 years old

What happens in your brain when you find out that someone thinks you're cool? Neuroscientists have recently started to investigate this by looking into how our brains process information concerning our reputation. Just a few years ago, it was discovered that when we learn that other people think highly of us, a key part of the brain's reward system is activated [1]. The reward system is a set of interconnected brain structures that gives us a pleasurable feeling when we obtain or do things with a positive value. Getting a compliment feels good, so it makes sense that the reward system might be involved.

A key brain structure in the reward system is the nucleus accumbens (pronounced: uh-'kuhm-benz), which is a very small but critical structure located deep in the center of the brain. The nucleus accumbens is activated by things that make us happy, such as eating good food or winning money. Recent research has demonstrated that if we show pictures of food to hungry people, the response of their nucleus accumbens will predict how much food they will eat later [2]. That is, the more sensitive a person's nucleus accumbens is to a reward in the laboratory, such as seeing food, the more likely the person is to try to obtain that reward in the real-world (eating food). With this in mind, we decided to investigate if a person's individual sensitivity to discovering that the person has a good reputation could predict a real-world behavior aimed at obtaining a good reputation [3].

The real-world behavior that we chose to predict was the intensity of their Facebook use, because people can manage their reputation on the Facebook website. The majority of the interaction on the Facebook website is in public, viewable by a Facebook user's group of friends, and because these interactions can affect beliefs and opinions about the user, Facebook use can impact one's reputation. Another key aspect of Facebook use is social comparison. By using Facebook, a person is able to observe others' behaviors and the comments and "likes" that they receive for their posts. As a result, Facebook users are able to compare themselves with others.

With this in mind, we conducted an experiment where participants either: (i) found out that they have a good reputation; (ii) found out that another person has a good reputation, or (iii) received money. While

participants experienced these things, we used a very large magnet to collect functional magnetic resonance imaging (fMRI) data. fMRI technology allows us to measure the brain activity by detecting blood flow. To explain a bit about fMRI, brain cells are activated when we do different things such as hearing, seeing, talking, walking – pretty much all human behaviors. Brain cells need nutrients when they are working, and fMRI measures the delivery of these nutrients through the blood to activated areas of the brain. Using fMRI, we examined whether the person's brain activity recorded during the experiment was related to the person's intensity of Facebook use in the real-world. Because people can manage their reputation and compare themselves to others on the Facebook website, we hypothesized that participants' nucleus accumbens response to discovering that their reputation is good, relative to discovering that another person's reputation is good, would predict their intensity of Facebook use. To note, we included the third, monetary reward condition to see if a relationship between a non-social reward (money) and Facebook use exists. We hypothesized that nucleus accumbens sensitivity to monetary reward should not predict Facebook use because personal use of the Facebook website is not motivated by obtaining monetary reward.

MATERIALS AND METHODS

Thirty-one participants (age range: 19–31 years old) were recruited by completing an on-line version of the Facebook Intensity Scale [4]. The Facebook Intensity Scale is a survey which asks about how much time a user spends on Facebook, how many friends a user has, and how much a user identifies with the website. Participants were selected to have a broad range of Facebook intensity scores.

The experiment took place over two different days. On Day 1, the Facebook users were given a brief on-camera interview consisting of questions like, "What do you like to do in your free time?" Participants then left the lab to wait for Day 2. Importantly, before the interview, they were told that between Day 1 and Day 2, the recorded video interview would be individually observed by 10 anonymous reviewers. These reviewers, after seeing the video, would select 10–15 words from a list of 200 adjectives that they thought accurately described the participant. When the participants returned for Day 2 of the experiment, they were placed in an fMRI scanner while they performed two different tasks (see Figure 1). In one task, the "description task," participants discovered what they believed the reviewers thought of them, or what the reviewers thought of another person who also took part in the experiment. In reality, the participants received a predetermined range of positive words for both themselves and the other participant. In the other task, the "card task," participants chose one of three cards and then found out if they won money.

RESULTS

To begin our analysis, we first looked at activity in the brain due to our tasks, without factoring Facebook use in the analysis. We examined brain activity specifically when a person finds out they have a

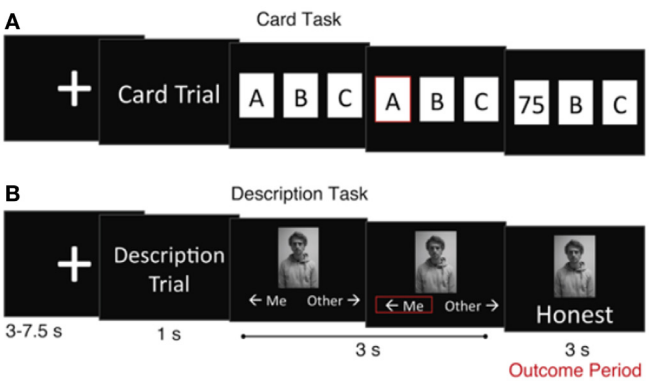

FIGURE 1 - The card and description tasks. At the beginning of each trial, the person was shown a message indicating which type of trial they were about to perform.
A. In the card task, participants were presented with three cards and required to choose one (answers were confirmed by a red outline around the card). The monetary outcome of their choice was then revealed. This outcome varied between around 80 cents and around 30 cents.
B. In the description task, participants saw a picture of either themselves or of another person whom they thought took part in the experiment. Participants were required to indicate the identity of the person in the picture (answers were confirmed by a red outline). A word was then displayed below the picture. Participants believed that this word was selected by the anonymous reviewers to describe the person in the picture. S, seconds.

good reputation and compared it to finding out that another person has a good reputation. We did this by examining brain activity during the outcome period in the description task, when participants discovered the positive words that they thought had been used to describe them (see "outcome period" in Figure 1). Our analysis revealed that the nucleus accumbens is more active when a person finds out they have a good reputation compared to when they find out that another person has a good reputation (see green color in Figure 2A, specifically in the box, which is around the nucleus accumbens). We next looked at brain activity in response to monetary reward by examining the outcome period in the card task, when participants received money. We compared brain activity when participants won money (around 80 cents) compared to when participants won smaller amounts of money (around 30 cents). Our analysis revealed that, as expected, the nucleus accumbens is more active when a person wins more money (see blue color in Figure 2A, specifically in the box).

We next addressed our main hypothesis concerning Facebook use. We had theorized that a person's nucleus accumbens response to discovering their reputation is good, relative to discovering that another person's reputation is good, would predict the intensity of their Facebook use. To address this, we again looked at brain activity in description task trials when a person finds out they have a good reputation and compared it to finding out that another person has a good reputation. Only this time we looked specifically inside the nucleus accumbens and investigated if the brain activity corresponded with each person's Facebook intensity scores. This analysis revealed an area in the left nucleus accumbens which demonstrates a relationship to the intensity of a person's Facebook use (see red-yellow color in Figure 2A Box; Figure 2B). This finding means that the more sensitive a person's nucleus accumbens is to discovering that they have a positive reputation, specifically in relation to seeing the positive reputation of another person, the more likely that person is to use Facebook intensely. We did the same analysis with monetary reward in the nucleus accumbens and Facebook intensity scores, and no significant results were revealed.

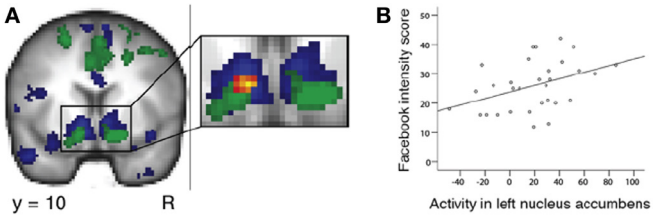

FIGURE 2 - Neuroimaging (fMRI) results demonstrating a relationship between the nucleus accumbens response to discovering one has a good reputation and Facebook use.
A. Brain activity in response to the different tasks. The green color depicts brain activity for description task trials when participants discovered their own good reputation, compared to when they discovered another person's good reputation. The blue color depicts brain activity during card task trials when a person won high amounts of money compared to when they won low amounts. The box is around the nucleus accumbens. Our analysis revealed a relationship in the left nucleus accumbens, between the reputation-related brain activity in green and Facebook intensity scores. This is depicted in red–yellow.
B. A graph showing the relationship between brain activity in the left nucleus accumbens and Facebook intensity scores. The brain activity is from description task trials when participants discovered their good reputation compared to when they discovered another person's good reputation. Each dot is a person in the study. Notice that moving from left to right (increasing brain activity), the dots trend from low to high (increasing Facebook intensity scores). This means the more nucleus accumbens activity a person has, the greater their Facebook intensity score. y = 10 Is the location of the brain section; R, right side.

DISCUSSION

We found that the nucleus accumbens response to discovering one's reputation is good, in relation to discovering another person's reputation is good, predicts the intensity of self-reported Facebook use. In other words, the more sensitive a person's left nucleus accumbens is to positive social feedback about themselves, specifically in relation to seeing the positive feedback received by another, the more likely that person is to use Facebook intensely. Conversely, the nucleus accumbens response to monetary reward did not predict Facebook use. These results make sense because:

- People use their personal profiles on Facebook to manage their reputation and obtain social rewards such as "likes," and

- People don't use their personal Facebook profiles to obtain monetary reward.

In conclusion, these findings extend our present knowledge of the nucleus accumbens' function as it relates to complex social behavior. To note, things that activate the reward system, such as winning money and ingesting certain drugs (e.g., nicotine from smoking cigarettes), can be addictive. So the reported results are also a small, first step in making the plausible neurobiological link between reward activity in the brain and increasing use of social media.

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Submitted: 13 October 2013; Accepted: 30 October 2013; Published online: 13 November 2013.
Citation: Meshi, D., Morawetz, C., and Heekeren, H. R. (2013). Facebook, being cool, and your brain: what science tells us. Front. Young Minds. 1:4. doi: 10.3389/frym.2013.00004

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I enjoy reading and thinking about life. I have a flair for the dramatic. Woe betide the contributor who falls under my editorial pen. I am in several theatrical productions and I like to go camping in the Canadian wilds. My comment on brains: I wish I had one.

AUTHORS

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Doing neuroscience research is fun! I conduct experiments to understand how we make decisions when we interact with other people. I want to understand how we value other people's opinions and how their opinions can motivate our behavior. When I'm not doing science, I like to draw odd geometrical shapes, and I love watching movies as well.

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